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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/098,730
Filing Date: June 18, 1998
Appellant(s): SUGIYAMA ET AL.

MAILED

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GROUP 1700

Michelle Lester
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 2-2-2006 appealing from the Office action mailed 8-9-2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The following are the related appeals, interferences, and judicial proceedings known to the examiner which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal:

Appeal 2002-1284 of which the Decision was mailed on 7-8-2003.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct except with regard to the rejection of claims 24, 27, 34 and 40, which the examiner has withdrawn. These claims are hereby only objected to as being dependent from rejected claims.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

No evidence is relied upon by the examiner in the rejection of the claims under appeal.

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1, 2, 4, 6, 7, 10, 11, 18-22, 26, 29-33, 36-39, 42-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mase et al 4,861,456 in view of Suzuki et al 4,177,112.

Mase discloses an alumina layer 54 sandwiched by an insulating layer 50 and an electrolyte layer 28, an alumina layer 34 sandwiched by electrolyte layers 8 and 10. The alumina layers are porous for the purpose of minimizing stress due to difference in thermal expansion coefficients. Thus, the alumina layers 54 and 34 correspond to applicant's "boundary layer". See col. 6, line 50 to col. 8, line 38. Bboundary layer 54 is immediately between insulator element 50 and electrolyte 28 without any intervening layer. See fig. 3 and col. 9, lines 8-15 for a discussion of the fact that the gas-tight layer should be an insulator. Applicant's claims differ by calling for the boundary layer to have an average sintered particle size larger than the average sintered particle size of the electrolyte layer and the insulating layer. Suzuki discloses forming a more porous layer 4' with larger particles than a neighboring layer 4. See col. 2, lines 38-49. It would have been obvious for Mase, in view of Suzuki, to employ particles in the alumina boundary layers 54 and 34 larger than the particles of its neighboring solid electrolyte layer and insulating layer so as to obtain an alumina boundary layer more porous than its neighboring layers. Using larger particles would be an efficient, easy way to ensure a higher porosity for the alumina boundary layer, and render it unnecessary for additional treatment to achieve the desired higher porosity. With respect to the limitation drawn to having the boundary layer be obtained by the sintering of original particles into sintered particles, it is unclear how this limitation defines away from Mase in view of Suzuki. In particular, Mase desires a boundary layer 20, 26,

34 or 54 that is porous as *the final product*. See col. 6, ll. 61-65. In addition, the final product of Mase is a sintered device. See col. 7, ll. 19-21. Suzuki teaches that *the final product* of its use of larger particles for the second coating 4' results in a layer that is more porous than the layer 4 made with smaller particles. Hence, one possessing ordinary skill in the art would have recognized that larger sintered particles could have been utilized to arrive at the porous boundary layers of Mase because larger particle material results in a more porous structure (see Suzuki).

With respect to claims 26 and 29-32, it would have been obvious to make Mase's ceramic layer 50 of alumina or spinel, because layer 50 borders heater 46. So as avoid current leakage from heater 46, ceramic layer 50 needs to be of an insulating material. Alumina and spinel are among the most common ceramic insulating materials known (see col. 6, line 53 of Mase) and each would have been an obviously desirable material for layer 50. Aside from the fact that alumina is inexpensive and readily available, making layer 50 of alumina would render it thermally compatible with the other alumina layers (20, 26, 34) of the sensor.

With respect to claims 45-48, the relative sizes of the various particles prior to sintering constitute the process for making the device. The determination of patentability for the claim is based on the product itself. Because the product of the claim is identical to the invention of Mase and Suzuki the process from which it was made is the same as or obvious over the process utilized by Mase and Suzuki (see *In re Thorpe*, 777 F.2d 695, 698).

Claims 25, 28, 35 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mase et al in view of Suzuki et al and Watanabe et al 4,370,393 or Ikezawa et al 4,421,787.

These claims further differ by calling for the electrolyte layer to be made of zirconia partially stabilized by yttria with an average sintering particle diameter of 2-3 microns.

Watanabe discloses yttria-stabilized zirconia to be a conventional solid electrolyte material. See col. 4, lines 25-29. Sample 22 in Table 1(c) shows a grain size of 3 microns. Ikezawa also discloses a conventional solid electrolyte of yttria-stabilized zirconia with a particle size of 0.5 to 8 microns. See col. 5, lines 21-41. It would have been obvious for Mase to adopt a yttria-stabilized zirconia electrolyte with a particle size of 3-4 microns in view of Watanabe or Ikezawa since the incorporation of known features from analogous prior art functioning ms expected is within the skill of the art.

Claims 37 and 43 are rejected in the alternative under 35 U.S.C. 103(a) as being unpatentable over Mase in view of Suzuki as applied to claims 33 and 39 above, and further in view of Mase et al (USP 4,559,126) (hereafter "Mase '126"). The primary Mase teaching will continue to be just "Mase".

If the combined teaching of Mase and Suzuki are construed as not meeting the limitation concerning the thermal expansion coefficient being "substantially the same", then Mase '126 teaches making the coefficients of expansion for the various sensor layers to be "substantially the same" to prevent the sensor from warping during sintering. See col. 2, lines 54-58; col. 4, lines 62-67; and col. 6, lines 7-15. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Mase '126 for the sensor of Mase and Suzuki to prevent warping of the sensor during sintering.

Claims 24, 27, 34 and 40 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

(10) Response to Argument

Appellant urges that the teaching of Mase '456 (hereafter "Mase") does not teach or suggest the breaking strength of the sensor can be improved when the size of the sintered particles among the boundary layer are greater than the size of the sintered particles of the solid electrolyte and insulated substrate. However, finding a new reason for doing what is old in the art does not impart patentability of the prior art. In this particular case, Suzuki already recognized that larger particles result in a more porous ceramic structure one possessing ordinary skill in the art would have been motivated to utilize larger particles to arrive at the porous structure of Mase.

Appellant urges that Suzuki does not teach anything concerning changing original particles into sintered particles. Although this is technically correct, it is noted that changing original particles into sintered particles is already an inherent part of the primary teaching Mase. In particular, Mase teaches the use of sintering to arrive at the fired sensor (col. 7, ll. 19-21) and any sintering changes original particles into sintered particles. In fact, this limitation about changing original particles into sintered particles, which was added to claims 1 and 18 after the affirmed decision of 7-8-2003, doesn't appear to further define the apparatus over the previous claims 1 and 18. In particular, the previous claims 1 and 18 (i.e. the versions of claims 1 and 18 that were previously appealed) already specified that the particles of the sensor were sintered particles. Changing original particles into sintered particles would be an inherent property of *any* sensor constructed via sintering, including Mase. Hence, it is unclear how this limitation could be construed as further defining the device. What Suzuki is being relied on for is the general teaching that larger particles create a more porous structure (i.e. larger pores) than smaller

particles. This would be true regardless of whether the larger particles were a result of sintering or of some other process.

Appellant also urges that if the particles of the second coating of Suzuki were applied to the boundary layer of Mase, then layer 54 would have grain sizes of approximately 40 μm. It is unclear why appellant is making this hypothetical argument because it is clear from all the previous rejections and the previous Appeal Decision that what was being relied on from Suzuki was not the particular particle sizes of Suzuki, but rather the teaching of using larger particles to arrive at a more porous structure. In fact, the previous Appeal Decision states "Suzuki teaches a relationship between porosity and particle size, wherein courser grains of alumina have substantially greater porosity and correspondingly larger particle sizes than finer grains of alumina" and "[w]e conclude therefrom that porous particles of refractory metal oxides have larger particles than less porous particles and likewise have larger particle sizes than corresponding electrolytic particles and insulating particles" (Appeal Decision, p. 5, ll. 8-13). Hence, the issue is not whether one would utilize the particular 40 μm particles of Suzuki, but rather would one be motivated to utilize *larger* particles to arrive at the desired porous layers of Mase.

Appellant further urges that there is no teaching or suggestion in Mase that the porous layers of Mase are more or less porous than the adjacent layers. The examiner believes this issue has already been settled from the previous Examiner's Answer. In particular, the previous Examiner's Answer established that the both the solid electrolyte layers and insulating layers should be non-porous, which was accepted in the previous Appeal Decision. See Examiner's Answer, p. 4, l. 12 through p. 5, l. 3 and Appeal Decision, p. 4, ll. 18-20. Moreover, it defies

logic to suggest that the only layers defined by Mase as being "porous" are actually less or as porous as other layers (including layers defined as "gastight" (col. 9, l. 11)), as the Appellant is suggesting with this argument. Because Mase disclosed that layers 20, 26 and 54, but not the other layers of the sensor, are porous, and because the previous Examiner's Answer clearly established why these other layers should not be appreciably porous, then it is clear that layers 20, 26 and 54 are more porous than the other substrate layers.

Appellant urges that the examiner has not given proper consideration to the process steps of claims 45-48 because it is only proper to ignore process steps when the final product is indistinguishable on the basis of the method by which it was formed. Appellant states that this is not the case here, but never offered any evidence to establish that this was the case here. Mase and Suzuki met the product limitations of claims 45-48 (i.e. the use of larger *sintered* particles for the boundary layer in comparison with the *sintered* particles of the substrate layers). What is the product distinction between the use of larger or smaller *original* particles if the end result of the process is larger sintered particles for the boundary layer.

Appellant's arguments concerning the rejection of claims 24, 27, 34 and 40 over the further teachings of Sugino and Tatumoto were persuasive and the examiner has withdrawn those rejections.

Appellant's arguments concerning the use of Wakanabe and Ikezawa appear to rely on their perceived failings of the rejections that preceded the use of these teachings. Those arguments above were not persuasive for the reasons set forth above and the further rejection using Wanaknabe and Ikezawa remains.

Appellant urges that with respect to the further rejection relying on Mase '126 that the original Mase only made layers porous 20, 26 and 54 porous to minimize any difference in thermal expansion between the two layers. Hence, if the teaching of Mase '126 were to be incorporated into Mase, then Mase wouldn't make its boundary layers porous. This argument is directly contradicted by the teaching of Mase '126. In particular, Mase '126, which has the same inventors as Mase, both teaches making the coefficients of expansion for the various sensor layers to be "substantially the same" (col. 2, ll. 54-58; col. 4, ll. 62-67; and col. 6, ll. 7-15) <u>and</u> also teaches the use of porous boundary layers as well (see fig. 3 and 4 and col. 2, ll. 27-29). Hence, Mase '126 teaches the use of porous boundary layers *even though* the layers being bound have negligible thermal expansion differences. Appellant's argument that it would not have been obvious to prevent warpage in Mase because the porous layers of Mase are for the prevention of flaking-off is not understood. It appears as if the appellant is urging that because Mase took some steps towards preventing the substrates from flaking off from each other due to thermal expansion differences, one possessing ordinary skill in the art wouldn't have been motivated to take the additional steps of minimizing any thermal expansion differences. Again this is contradicted by Mase '126 who both minimizes thermal expansion differences *and* utilizes porous layers analogous to those of Mase. In addition, warping would be detrimental to the sensor for reasons other than the potential for flaking off of the substrates. Hence, even if Mase's porous layers prevented flaking off, one possessing ordinary skill in the art would still have been motivated to also prevent the warpage of the sensor.

(11) Related Proceeding(s) Appendix

Copies of the court or Board decision(s) identified in the Related Appeals and Interferences section of this examiner's answer were provided by the Appellant.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Kaj K. Olsen

Conferees:

Nam X. Nguyen

Patrick Ryan